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A COMPREHENSIVE PROGRAM FOR WATER POLLUTION CONTROL FOR THE ST. CROIX RIVER BASIN

Public Health Service
Washington, D. C.

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Water Pollution Series No. 60

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for the

ST. CROIX RIVER BASIN

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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A COMPREHENSIVE WATER POLLUTION CONTROL PROGRAM

for the

ST. CROIX RIVER BASIN

Developed by the State Water Pollution Control Agencies

of

MINNESOTA and WISCONSIN

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U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service

FOREWORD

Our country's development over the past 50 years has been marked by tremendous progress in many fields. It has made possible great gains in the health, comfort, and well-being of the people. But it has not been without cost. Part of the cost has been the damage to the Nation's water resources that has resulted from wastes discharged to the streams by our growing cities and industries. All water uses have been affected--public water supplies, recreation, agriculture, industry, fish and aquatic life.

In enacting the Federal Water Pollution Control Act in 1948, the Congress declared that "Water pollution has become a matter of grave concern in many areas and its damaging effects on the public health and national resources are a matter of definite Federal concern as a menace to national welfare. Abatement must be undertaken in order to control it."

The Public Health Service, as part of its responsibilities under this Act, is required to prepare or adopt, in cooperation with other Federal agencies, State and interstate water pollution control agencies, and municipalities and industries, comprehensive programs for the abatement of pollution.

This publication summarizes the "Comprehensive Water Pollution Control Program for the St. Croix River Basin" of the Minnesota State Department of Health and the Wisconsin Committee on Water Pollution. The program is sound and gives full consideration to the several present uses and to the reasonably-anticipated future uses of the waters of the basin. It provides an equitable balance in the pollution control requirements for various private and public groups concerned.

I am pleased, therefore, in my capacity as Surgeon General of the Public Health Service to adopt the program developed by the Minnesota State Department of Health and the Wisconsin Committee on Water Pollution as a comprehensive program which fully meets the requirements of the Federal Water Pollution Control Act.

This program is based on beneficial water uses and related conditions that prevailed on January 1, 1953. Comprehensive programs for pollution control must necessarily be flexible. They must allow for growth, development, and changing conditions. Any significant changes affecting water quality, such as stream flow, water use, industrial development, population, etc., may require changes in the pollution control program.

Obviously the mere adoption of this program will not, in itself, reduce pollution or improve the usefulness of the waters of this basin. It does provide to the citizens of the area and to the city officials and industrial leaders, farmers, fishermen, conservationists, and others an objective plan based on good engineering practice and reflecting sound economics. It is a plan which the public can support, and must support, if progress is to be made in the abatement of pollution.

Certain additional considerations beyond the mere acceptance of a plan are essential to its successful execution. The citizens of the areas affected must see that sufficient resources are provided to the State water pollution control agencies concerned to enable them to make the technical investigations necessary to aid those responsible for constructing pollution abatement works.

We must recognize, too, that in order to be fully effective the plans and programs of one State must be geared closely to those of adjoining States, since State boundaries are no barrier to pollution traveling in interstate streams. Above all, no program of this nature can progress beyond the report stage if its meaning and purpose are not made clear and understandable to the citizens of the area. In the final analysis they are the ones who will pay, directly or indirectly, for the pollution abatement works needed.

It is my hope that this program for the St. Croix River Basin will be carried through to completion as soon as possible so that the area may enjoy all the benefits that clean water can provide, in health and recreational opportunities for the people and in sound growth of industry and agriculture.

Leonard A. Scheele

Leonard A. Scheele
Surgeon General

INTRODUCTION

The comprehensive program for the St. Croix River Basin is based on the programs of the water pollution control agencies of Minnesota and Wisconsin for this drainage basin. Reports of State or State and Federal cooperative investigations of this interstate stream have been published and have considered present and anticipated future water uses, the quality of water necessary to permit these uses, sources of pollution and their effects on receiving waters and water uses, benefits derived from abatement of pollution, the added detrimental effect of critical low flows in some tributaries, and needed abatement facilities. These reports upon which this program is based are as follows:

(1) The Pollution of the St. Croix River - Report of Joint Investigation by the Minnesota State Board of Health and the Wisconsin State Board of Health in collaboration with the Minnesota Department of Conservation (1935). (Area concerned - main stem from the dam at St. Croix Falls to the Mississippi River.) Reference copies are on file with the Minnesota and Wisconsin State Health Departments and the Upper Mississippi and Great Lakes Drainage Basins Office, Public Health Service.

(2) The Upper Mississippi Eastern Tributaries - Drainage Basin Study Plan of the National Resources Committee, Water Resources Committee (1937). (Area concerned - entire drainage basin.) Reference copy on file with the Upper Mississippi and Great Lakes Drainage Basins Office, Public Health Service.

(3) Report of the Follow-up Investigation of the St. Croix River - Report of the Joint Investigation by the Minnesota State Board of Health, Minnesota Water Pollution Control Commission, and the Wisconsin State Board of Health (1946). (Area concerned - St. Croix River from the dam at St. Croix Falls to the Mississippi River.) Reference copies are on file with the Minnesota and Wisconsin State Departments of Health and the Upper Mississippi and Great Lakes Drainage Basins Office, Public Health Service.

(4) Upper Mississippi Drainage Basin Report - Cooperative Report by Public Health Service and Water Pollution Control Agencies in Illinois, Indiana, Iowa, Minnesota, Missouri, North Dakota, South Dakota, and Wisconsin (1951). (Area concerned - entire drainage basin.) Available through the Upper Mississippi and Great Lakes Drainage Basins Office, Public Health Service, and Minnesota and Wisconsin State Health Departments.

LOCATION MAP

ST CROIX RIVER BASIN

GENERAL REFERENCE MAP

U. S. DEPARTMENT OF
HEALTH EDUCATION AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

2

GENERAL DESCRIPTION

The St. Croix River rises in Upper St. Croix Lake, Douglas County, Wisconsin, at an elevation of about 1,000 feet above sea level and flows in a southerly direction for 164 miles until it enters the Mississippi River at Prescott, Wisconsin. The lower 120 miles of the stream form a portion of the boundary between Wisconsin and Minnesota. It drains 3,250 square miles of eastern Minnesota and 4,400 square miles of northwestern Wisconsin. The main tributaries are the Kettle, Snake, Sunrise, Namekagon, Yellow, Clam, Wood, Apple, Willow, and Kinnikinnic Rivers.

The climate is temperate with average monthly temperatures varying from 11° F. in January to 68° F. in July. The average annual precipitation for this area is about 29 inches. Snowfall averages about 45 inches with about 100 days per average year of one inch or more snow cover on the ground.

Long-term flow records are available for six gauging stations in this drainage basin (U. S. G. S. Surface Water Supply Papers, Part 5 - Hudson Bay and Upper Mississippi River Basin). These six stations include four on the St. Croix River, with the downstream station located at St. Croix Falls, Wisconsin, one station on the Namekagon River near Trego, Wisconsin, and one station on the Apple River near Somerset, Wisconsin. On the basis of 43-year average daily records for the station at St. Croix Falls, Wisconsin, a flow of 1,100 c.f.s. or more may be expected 95 percent of the time in the St. Croix River. Some of the tributaries in the basin have experienced periods of very low flows, and in a few instances the streams have gone dry.

Normally, the lowest average monthly flow of the streams in this basin occurs in January and February. During the winter months almost all streams in the basin are completely covered with ice. These two factors are significant from a pollutional standpoint, since the natural re-aeration capacity of waters is reduced during ice coverage, and this, coinciding with low flows, seriously reduces the pollution assimilation capacity of the streams. Dams were constructed to control the water level of several of the numerous lakes in the basin for logging purposes, and these dams tend to sustain the spring runoffs over a considerable length of time.

The abundance of ground water is indicated by the fact that all of the communities in this basin having public water systems obtain their supplies from ground water sources. In the northern part of the area, ground water is available from the glacial drifts while in other areas ground water supplies are obtained from the Cambrian sandstone. Some communities have to drill wells to considerable depths for a suitable water supply.

There are 33 sewered municipalities and institutions with a total connected population of about 43,000 in the basin. Twenty-five of these municipalities with a total population of 29,800 are served by treatment facilities although seven are reported to have inadequate capacity. The eight remaining communities having a connected population of about 13,600 discharge sewage directly to the stream without treatment.

Despite the pollution abatement progress made in this basin, according to available data, the amount of pollution discharged to the watercourses is in excess of 39,000 or 90 percent of the total sewered population. This is explained by the fact that the municipal sewers carry a considerable industrial waste load in addition to the actual population served by sewers. A few of the municipal plants which now have inadequate capacity are overloaded by the large amount of industrial wastes (chiefly from milk processing plants), which is discharged into the municipal sewers.

Eleven industries discharge their wastes directly to the watercourses. Four of these industries provide treatment although three of these facilities are reported to be inadequate. Almost all industrial wastes originate at canneries and milk processing plants and are organic in nature.

The St. Croix River, from Osceola to below Hudson, Wisconsin, receives a larger pollutional load than any other watercourse in the basin. Osceola and Hudson, Wisconsin, and Stillwater, Minnesota, as well as three industries (a dairy, a cannery, and railroad shops), discharge inadequately treated or untreated wastes. These wastes produce floating solids, sludge deposits, and undesirable coliform bacteria densities in the stream. Untreated and inadequately treated municipal and industrial wastes have resulted in nuisance conditions, high bacterial densities, and critical dissolved oxygen concentrations in such tributaries as the Kettle River, Moose River, Snake River, Sunrise River, Yellow River, and Kinnikinnic River. In most instances, the polluted condition of the stream is noticeable for only a short distance below the municipal or industrial outfall with the effects of pollution generally being confined to a five- or ten-mile stretch of the stream.

The concentration of suspended sediment in this basin is low and is not considered to be a pollution problem. This can be attributed to the fact that over one half of the watershed in Minnesota and all of the Wisconsin portion of the watershed are now organized in soil conservation districts, plus the fact that a large proportion of the area has a brush and forest cover.

The major use of water in the basin is for recreational purposes. Although the area is predominantly rural, the agricultural yield is low, and many residents have developed recreational facilities to attract tourist and vacation trade for supplemental income. Many camps, hotels, and resort cabins cater to vacationists, and swimming, boating, canoeing, and game fishing are popular sports. Much of the basin, particularly in the less populated northern section, is covered with brush and second growth timber where deer, small game, and game birds are plentiful. The presence of such varied game makes the region very popular with hunters and sportsmen for several months of each year. Many summer resorts extend their season by catering to hunters during the deer and duck seasons.

It is recognized by water pollution control authorities that beneficial water uses require water of a particular quality. Water quality objectives have generally been used by water pollution control agencies for many of the water uses.

Contamination of bathing waters by sewage, especially that of recent origin, is objectionable, as water for recreational usage should be free from

pathogenic organisms, floating solids, sludge banks, odors, and discoloration. Quality objectives for the bacteriological quality of bathing waters recommended by the Joint Committee on Bathing Places (Joint study by the American Public Health Association and Conference of State Sanitary Engineers, covered in a report entitled "Recommended Practice for Design, Equipment, and Operation of Swimming Pools and Other Public Bathing Places," 1949), together with sanitary surveys, are employed in the administration of pollution control programs as related to bathing waters of the St. Croix. Under the Joint Committee interpretation, various classifications of waters are defined as based on the number of coliform organisms per 100 milliliters of water. Other indices of quality, as enterococci, are receiving increasing attention; however, sanitary surveys are employed in pollution control programs as related to bathing waters. Although quality objectives for water used for non-swimming recreation do not set forth as high a bacteriological criterion, the same basic fundamentals are used by the States in their programs.

A wide variety of fish is found in the streams and lakes of the basin. Smallmouth bass are plentiful in both the main rivers and feeder streams, such as the Kettle and Snake Rivers in Minnesota, and pike may be taken from many of the rivers and lakes. Striped bass are caught in Lake St. Croix while a number of the smaller streams of the area, such as the Namekagon River in Wisconsin, are known for their good trout fishing. A sizable commercial fishery of rough fish exists on the lower section of the main stem between Taylor Falls, Minnesota, and Prescott, Wisconsin. Clamming, although of minor importance, is practiced in the lower St. Croix River.

Water quality objectives for fishing waters vary with the type of aquatic life to be protected. The general objectives advocated by the U. S. Fish and Wildlife Service calling for a balanced aquatic life habitat and limiting concentrations of pollutional substances are usually used by authorities in this basin. Consequently, sludge beds, silt sedimentation and other deposits, which tend to blanket the stream bottom and destroy the biological life necessary for the existence of fish, are highly undesirable.

Agriculture is an important factor in the economy of the basin since the area is predominantly rural in nature. In those areas where livestock production and dairying are practiced, the streams and lakes are used quite extensively for stockwatering. Water quality objectives for stockwatering have not been precisely defined, but the authorities agree that the elimination of such pollution as floating and settleable solids and high bacterial concentrations is desirable if the water is to be used for agricultural purposes.

Thirty-seven of the 67 incorporated communities in the basin have public water supplies. All of these supplies are obtained from ground water sources; and at the present time, no surface waters of the basin are being used for municipal water supplies. However, in some areas of this basin natural ice is harvested from the streams and lakes in the winter. This ice when used for human consumption, either directly or indirectly, should be equal in quality to water used for domestic water supply.

There are 23 dams and hydroelectric plants at present in operation in the St. Croix Basin for the production of electric energy. The most important

installation is located on the lower St. Croix River at the twin cities of Taylor Falls, Minnesota, and St. Croix Falls, Wisconsin. While several of the early dams were erected for flow control on behalf of the logging industry, at present they all serve to regulate the stream flow for the purpose of more economical power generation. The St. Croix River from its mouth to the dam at St. Croix Falls is used for commercial navigation. In 1948, a total of 11,500 short tons of domestic freight traffic was carried on this section of the river. Coal was the main freight item shipped into the area. In addition to the substantial usage of the river by fishing parties, 105,000 passengers were carried by commercial carriers on excursion and sight-seeing trips in 1949.

The Minnesota Water Pollution Control Commission and the Wisconsin Committee on Water Pollution have in force the following joint resolution relative to the abatement of pollution on the St. Croix River:

> "Whereas the St. Croix River is an interstate stream common to the States of Minnesota and Wisconsin and pollution thereof originating in one state does or may adversely affect public health or public rights in both states, thus creating a problem of common interest and requiring correction by said states; and
>
> "Whereas sewage and industrial wastes now discharged into said river and its tributaries do create or are likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate uses, or to livestock, wildlife, fish or other aquatic life; and
>
> "Whereas protection of public health and preservation of public rights demand that said waters shall be made suitable for legitimate uses; now, therefore, be it
>
> "Resolved, that the Minnesota Water Pollution Control Commission and Wisconsin Committee on Water Pollution each does hereby agree to require the effective correction of existing pollution and prevention of additional pollution within the boundaries of its state as provided by the laws of such state to the end that said waters may be maintained or rendered suitable for all purposes heretofore defined and that in furtherance of said objectives the guiding policy shall be the requirement that facilities for treatment of sewage for all severed municipalities shall provide at least effective sedimentation plus chlorination, with such design of treatment plants that secondary or other higher degrees of treatment may be added as conditions may require, and that facilities for treatment of industrial waste shall provide the most effective treatment warranted by conditions in each case with the understanding that additional or special type treatment be required where water uses so dictate;. . ."

WATER POLLUTION CONTROL PROGRAM

The State water pollution control agencies have been aware of the pollution problems in the St. Croix River watershed, as is indicated in the several reports on the subject. They have cooperated in establishing a comprehensive program designed to correct undesirable conditions. Much has already been accomplished towards completion of this program as evidenced by the fact that 25 of the 32 sewered municipalities provide treatment for their wastes. Four industrial waste treatment plants have also been constructed in the basin. Seven municipal and two industrial treatment works have been completed and placed in operation since 1948. However, the construction of a number of new municipal and industrial waste treatment works, and enlargements and additions to some of the existing treatment plants, are required to complete the program. The need for improved operation of some existing waste treatment works is also recognized as part of the program.

The water pollution control program for the St. Croix River Basin is firmly based upon the findings of a number of stream studies, surveys, and investigations. The corrective measures were determined only after a thorough consideration of all existing beneficial water uses in the basin as well as those that might materialize in the immediate foreseeable future and are intended to restore, preserve, and protect water quality for their uses.

The program is flexible, not static, and is intended to reflect the needs for the present situation as currently determined, but changes in stream characteristics, pollutional load, or water uses may require revision from time to time.

The essential elements of the program as developed by the States concerned consist of the following:

1. Provide the following improvements at the earliest possible date:

Name and Location	Population Equivalent Discharged	Degree of Existing Treatment	Needed Pollution Control Measures
Amery, Wis.			
Lakeside Packing Co.	330	Minor	Additions to existing plant
Barnum, Minn.	450	None	New treatment plant
Frederic, Wis.			
Stokely Foods, Inc.	--	None	New treatment plant
Grantsburg, Wis.			
Wood River Coop. Cry.	120	None	New treatment plant
Hinckley, Minn.	900	None	New treatment plant
Hudson, Wis.	3,600	None	New treatment plant

Name and Location	Population Equivalent Discharged	Degree of Existing Treatment	Needed Pollution Control Measures
Lakeland, Minn.	--	Minor	Additions to existing plant
Milltown, Wis.			
Stokely Foods, Inc.	--	None	New treatment plant
Mora, Minn.	2,900	Primary	Enlarge existing plant
New Richmond, Wis.	2,000	Primary	Enlarge existing plant
Friday Canning Co.	15,000	Primary	Replace existing plant
North Branch, Minn.	1,400	None	New treatment plant
North Hudson, Minn.			
C. St.P. M. & O. RR	--	None	Connect to municipal sewer system
Ogilvie, Minn.			
Farmers Coop. Cry.	240	None	New treatment plant
Osceola, Wis.	650	None	New treatment plant
Maple Island Dairy	70	None	Connect to municipal sewer system
Pine City, Minn.	3,500	Primary	Enlarge existing plant
Pine City Coop. Cry.	600	None	Connect to municipal sewer system
River Falls, Wis.	1,500	Secondary	Enlarge existing plant
Rush City, Minn.	1,900	Primary	Enlarge existing plant
Sandstone, Minn.	2,500	None	New treatment plant
Shell Lake, Wis.	810	Primary	Enlarge existing plant
Spooner, Wis.	3,100	Primary	Replace existing plant
Stillwater, Minn.	7,300	None	New treatment plant

2. Operate all existing municipal and industrial waste treatment works at a uniformly efficient and high level in order to obtain the maximum benefits from these facilities and permit their most effective utilization.

3. Control new or increased sources of pollution by providing adequate treatment.

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